DOCUMENT RESUME

ED 062 147 SE 013 579

AUTHOR Novak, John H.; Moser, Gene W.
TITLE A Study of the Effect of Timed Pupil Feedback on the Teaching Behaviors of Biological Science Teachers.
PUB DATE Apr 72
NOTE 29p.; Paper presented at the National Association for Research in Science Teaching Meeting, Chicago, Illinois, April 1972

EDRS PRICE MF-$0.65 HC-$3.29
DESCRIPTORS Behavior; Biology; Classroom Research; *Feedback; Interaction Process Analysis; Secondary School Science; *Student Opinion; Teacher Evaluation; *Teacher Improvement

ABSTRACT

Biology classes of 15 teachers in three high schools were provided with a response sheet and requested to rate each ten-minute segment of lessons on each of three contrasts: too fast/too slow; interested/bored; and understand/don't understand. They were also requested to make specific comments if they felt them necessary. It was found that students were able to give effective feedback to teachers, and that this feedback caused changes in teacher behavior. Analyses of the data were most meaningful when the changes within a single class were considered: changes in different directions in different classes obscured significant effects. Tabular and graphical data presentations are appended. (AL)

ED 062147

U.S. DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
OFFICE OF EDUCATION
THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY

A STUDY OF THE EFFECT OF TIMED PUPIL FEEDBACK ON THE TEACHING BEHAVIORS OF BIOLOGICAL SCIENCE TEACHERS

(Research supported by the U. S. Office of Education
Bureau of Research, Contract OEG 3 72-0010)

NATIONAL ASSOCIATION FOR RESEARCH IN SCIENCE TEACHING

April 4, 1972
Chicago, Illinois

John H. Novak
Gene W. Moser

Science Education
2609 Cathedral of Learning
University of Pittsburgh
Pittsburgh, Pennsylvania 15213

SE 013 579

TABLE OF CONTENTS

I. Introduction 1

II. Related Literature 1

III. Statement of the Problem 3

IV. Procedure 3

V. Findings 7

VI. Conclusion 13

Appendices

Appendix A 15

Appendix B 16

Appendix C 17

Appendix D 21

Appendix E 24

Bibliography 27

I. Introduction

An inability to perceive and react to student impressions (impressions such as: too fast, too slow, boredom, interest, understanding, etc.) hinders a teacher's ability to encourage student participation, maintain interest, and promote the inquiry strategies suggested in many of the new curricula. If teachers are to develop the ability to assess and utilize students' reactions to their classes, they must recognize pupils as integral parts of the instructional process. It is the purpose of this study to determine if the use of a pupil reaction device will cause teachers to become more aware of the attitudes of their pupils. This awareness will be reflected in the teacher's willingness to vary teaching behavior in order to promote more positive student feedback.

II. Related Literature

Grace E. Bird, in 1917, tried to describe an effective teacher by using feedback given by pupils.[1] The children were asked to write a description of their favorite teacher and to tell why the teacher was their favorite. What emerged was that students favored teachers who were responsive to their immediate needs.

Roy C. Bryan studied the use of pupil ratings to improve teacher effectiveness in 1938.[2] The findings of the study, as reported in School Review, indicated teachers did react to student ratings given them at the beginning of the school year as evidenced by an increase in favorable scores given at the end of the year. Albert, observing that teachers are usually

only rated by a principal or supervisor, developed his own rating scale to be used by students to determine their likes and dislikes in teacher behavior.[3] He found that student ratings did have an effect on teacher performance. Earl C. Bowman, reporting on pupil ratings of student teachers, used ratings of student teachers prepared by pupils and compared them with ratings given the same student teachers by critic teachers.[4] He found very little agreement between pupil and critic teacher judgment as to the presence or absence of desirable traits described by the Purdue Rating Scale of Teacher Efficiency.

Remmers has pointed out that student evaluation has proven "reliable", "convenient", "useful", and "valid".[5] One of the more interesting major generalizations drawn from research using the Purdue Scale is: Ratings of teachers by groups of 25 or more students are as reliable as any other means of rating. Smith reported on the Student Evaluation of Teachers Committee, where the "evaluator" asked the pupils, as a group, pertinent subjective questions about the teacher.[6] Smith found the pupils to be". . . competent judges of teaching skill."[6] Hedges and MacDougall urged that a monitoring device be implemented to tell the teacher what the student perceives to be going on in a classroom so that he may have immediate feedback of pupil reaction.[7] William D. Coats, using the Teachers Image Questionnaire as prepared by Educator Feedback Center at Western Michigan University, found the single most important item which appeared to influence a teacher's rating by pupils was whether or not the students liked the teacher.[8]

III. Statement of the Problem

This study attempted to show that a teacher's pupils can be used to provide an effective and sensitive measure of teaching behavior in the form of timed hard copy feedback given the teacher at the end of each lesson. This study further attempts to describe the behavioral changes brought about by the pupils' hard copy feedback and the permanancy of any change once the pupils' written feedback stops.

IV. Procedure

A population of 15 tenth grade biological science teachers were chosen from three separate high schools within Allegheny County during the 1971-72 school year. For each of the teachers and their pupils taking part in the study, the following preliminary data were gathered.

Pupils	Teachers
(1) age	(1) age
(2) grade level	(2) school where presently teaching
(3) I.Q. -	(3) school graduated from
(4) socio-economic group	(4) sex
(5) school attending	(5) years experience teaching
	(6) years experience teaching subject
	(7) number of credit hours in teaching field

Nine of the total 15 teachers chosen for the first three months of the study were designated as Group I. Audio tapes of one class were made of each of the nine teachers. The class period chosen for each teacher was the only class for that teacher to be used throughout the three months. Two audio tapes per week were taken of the experimental class. The time of the taping was chosen at random. (The reasons for taping

the classes in month (1) was to establish a base line of teaching behavior.)

During the second month, in addition to continued audio taping, the cooperating teacher was asked to pass out to his pupils the rating sheet (see Appendix A) with these instructions: "I want you to help me to help you learn biology. The sheet of paper you have on the desk in front of you is a means for you to tell me how I did today in trying to teach you biology. You will notice that the blocks from left to right are marked with comments and at the end of the blocks is a line with numbers ranging from 10 to 50. What you are to do is, if at the end of ten minutes you think I was going too fast, you check "too fast". If I was boring you, check "boring". If it was interesting, check "interesting", etc. If you wish to say something else, just write it on the line provided. Then the next time you check will be at the end of the next ten minutes (or 20 minutes after the lesson started), continuing in ten minute intervals all the way to the end of the lesson. If you forget or are too busy to check the clock, just skip over it and check when you have time, but do it in the appropriate time line. For example, it is now 12:00. If the next time you think to check the sheet it is 12:20, check the 20 minute line, not the 12:10 line." The teacher continued to explain these directions until he was satisfied that he was understood. He then gave the planned lesson for the day and collected the sheets at the end of the period. If he found they did not follow instructions, he went over the instructions again the next day.

The teacher was asked to use the rating sheets at least

twice per week during the first three weeks of the second month and only if he or his students felt they needed them during the last week.

The teacher was asked to review the feedback written by his pupils on the sheets given him at the end of the experimental class to see how his students received his lesson. The cooperating teacher was also urged to respond to the sheets in such a manner as would emphasize behaviors and procedures that the pupils felt were good and to modify those behaviors or procedures that in the pupils' judgment needed changed.

During the third month, the nine teachers were asked not to use the pupil feedback form. Audio taping of the classes continued however, and three audio tapes were chosen for analysis.

The following outline describes the schedule and the use of the response instrument.

Outline of Procedure

Month (1)

1. Nine teachers chosen.(Group I)
2. Background data taken.
3. Audio tapes taken of each teacher during designated class period(s).
4. Three audio tapes chosen at random for each teacher.

Month (2)

1. Group I teachers explain rating device to pupils.
2. Teachers utilize rating device.
   a. First week - two times
   b. Second week - two times

c. Third week - two times

d. Fourth week - as the teacher feels necessary.

3. Audio tapes taken of selected classes.

4. Three audio tapes chosen at random for each teacher.

Month (3)

1. No rating device used by Group I teachers.

2. Audio tapes taken and three chosen at random for each teacher.

Month (4)

1. Six teachers chosen. (Group II)

2. Background data taken.

3. Audio tapes taken of each teacher during designated class period(s).

4. Three audio tapes chosen at random for each teacher.

Month (5)

1. Group II teachers explain rating device to pupils.

2. Teachers utilize rating device.

a. First week - two times

b. Second week - two times

c. Third week - two times

d. Fourth week - as the teacher feels necessary.

3. Audio tapes taken of selected classes.

4. Three audio-tapes chosen at random for each teacher.

Month (6)

1. No rating device used by Group II.

2. Audio tapes taken and three chosen at random for each teacher.

V. Findings

Preliminary analysis

Three separate high schools participated in the study. School A is an urban, middle class high school with an enrollment of 3,200. High School B is an urban high school with an enrollment of approximately 500 lower socio-economic students. High School C is in an upper-middle class suburb with an enrollment of over 2,000.

Facilities at each school, provided for biology, ranged from a room with only a teachers' desk and student chairs, to elaborate laboratory set-ups with a green house and animal rooms. Only two of the 15 groups were scheduled for biology for more than five periods per week. These two had two extra laboratory periods per week; for a total of seven. The average class size was 32 students with a range of 27 - 36. The mean I.Q. of all participating students was 104 with a range of class mean I.Q.'s of 93 - 121. Pupils ages averaged 15.4 years and 90 per cent of the students were in the tenth grade.

Teachers participating in the study ranged in age from 23 - 50 years old and had experience in teaching biology which ranged from 1 - 15 years. The mean years experience was four years. There were 12 men and three women in the group. They graduated from ten different colleges and universities.

Three tapes for each teacher for each month of the study were selected at random and coded using a modified Para'kh Interaction Analysis System.[9] Each selected tape was further coded using a Gallagher-Aschner Questioning Category System Analysis.[10] The monogram codes of the Para'kh were then placed

in a six-set matrix (Appendix B) and the per cent of lecture, per cent of discussion plus inquiry, and the per cent of transition* was calculated for each six-set for each teacher.[11]

Data Analysis

The entire group of teachers were checked for significant change over the three months with respect to the per cent of lecture discussion and transition, using the chi square test
01 for k independent samples.[12] The results showed: No significant difference in the six-set analysis of the group teacher behavior over the three months period.

Group teacher behavior was again inspected comparing months one to two, months one to three, and months two to three.
02 The results indicated: No significant differences in the six-set analysis of the group teacher behavior was found between any pairs of months. This finding will be discussed below.

Data for each teacher were then tested for significant differences in the six-set analysis of behavior over the entire three months, and between months one and two, one and three,
03 and two and three. Significant differences in six-set analysis were shown for most teachers. (See Appendix E Table 1)

The first five sets of completed pupil reaction forms collected by all 15 teachers were totalled and treated for per cents (See Table 2, Appendix E and Graphs 1 - 4, Appendix C). An interpretation of Graphs 1 - 4, Appendix C showed:
04 Little difference in the per cent of reaction in any category over the entire time frame. It is then reasonable to assume that the pupils were not reacting in a "set pattern" regardless

*Transition is a term to describe modes of performance which lead into or out of the major modes: see Appendix B.

of teacher behavior. However, an increase in the total entries in the 20 - 30 minute time block may be indicative of the time-honored tradition that nothing much happens in a class at the beginning and at the end.

The data of four teachers were selected at random. Each teacher"s pupil reaction sheets were compared from response set one through set five for significant change in the per cent of each category checked by the pupils. Significant differences were found in the responses from set one through set five.

It was reasoned that if the student-rating forms were having a positive effect on most of the teacher's behavior, then the ratio of all the students' positive to negative reactions would increase as time went on. It was found that the direction of change was positive for responses made by the students. (See Graphs 1 - 3, Appendix D)

Product-moment coefficients of correlation and regression analysis[13] treatments were used to test the significance of relationships between student responses and the six-set analysis of teacher behaviors for the total lessons coded during the treatment month. Only five per cent of the test values were found to be significant at the five per cent level. The lack of significance was found to be attributable to the smoothing of data when grouped for lessons averaging 42 minutes in length. It is quite logical that when considering the approximately 30 students who respond to behavior in a classroom every ten minutes, the total behavioral responses cannot reliably define the environment.

It was then decided to select one 10-minute time interval

from each lesson and test the relationship of the pupil reactions to the six-set analysis of that interval. The lessons were chosen on the basis that they would be the first lesson taught by the teacher, and which had a corresponding set of pupil-rating sheets. The 20 - 30 minute time interval was chosen because it had an overall high N of responses given by pupils. Product-moment coefficients of correlation and regression analyses were then used to test the significance of relationships between student responses and six-set analysis of teacher behaviors for 14 of the teachers during the given 10 minute time frame. It was found that three of the nine tests showed significant correlations at the five per cent level and two at the ten per cent level. (See Table 3, Appendix E).

09

Analysis of Findings

The ability of students to sensitively and effectively give hard copy feedback to teachers is pointed out by findings O1 and O2, where it was shown there were no significant differences between the three months of group teacher behavior. This can be expected if individual differences of teachers are considered by students and their reactions are to their teacher only and their reactions change as the teacher behavior changes. Although teacher A may change from a more lecture oriented behavior to a more discussion oriented behavior in response to the students' feedback, this change could be cancelled by teacher B's "movement" in the opposite direction in response to his students. These changes of behavior by different teachers is unique and the effect is that grouped data-treatments become less meaningful.

There seemed to be no pattern for filling out the reaction forms (Findings 04 and 05). The students indicated they were as bored the first ten minutes as they were during the last ten minutes. Of course it was equally probable for them to be bored in the intervening intervals. On the other hand, the number of students responding at any one time interval is highly dependent to how close the time is to the middle of the lesson. The Parakh Analysis[9] of the original tapes point out a possible explanation to this finding. There was little likelihood of anything of import happening in the first ten and last ten minutes of a class period. Most of this time was spent in processing routine procedures, generally wasteful activity, or conversation on the part of students and teacher.

If students were reacting to their teacher and reporting it accurately as they perceived it on the reaction form, then as the teacher behavior changed, so too should the reaction form responses change. Finding 06 points out that there were significant changes in the day to day rating of each individual teacher sampled.

The overall change in reaction for all pupils is illustrated by finding 07. The changes of ratios in "favorable" reaction by the students are indicative of teacher change. The change in teaching behavior is further illustrated by (Table 1 Appendix C) finding 03. With the exception of teacher C, all teachers changed significantly over the three month period. The major changes occured between the first and second months and first and third months. The lowest amount of change was between the second and third months, however, only four chi

square tests were found not to be significant below the .05 level. This seems to be due to the teachers changing to a lesser degree after the second month of the study.

The general direction of change in overall behavior during the three months, although not significant, was toward more lecture. During the treatment month, however, the direction was non-determinant for the group. Some teachers moved toward giving more lecture while others moved toward more discussion and transition. One of the most interesting findings was 09. A positive correlation exists between the amount of lecture and the percentage of students responding to "understand" on the rating sheet and a negative relationship to the amount of discussion and transition. This then could account for those teachers who maintained or increased their amount of lecture during and after the treatment month. Finding 09 also shows a negative correlation between the "good" response and the amount of lecture and a positive correlation between transition and "good".

It would seem, for these groups of teachers and students, the students feel that in order to "understand", lecturing is desirable and the amount of discussion with their peers seems to decrease their willingness to check the "understand" reaction square. On the other hand, teacher led discussion, described as transition, is considered "good" by the students.

The reasoning behind this seeming paradox could be any or all of the following:

1. If a teacher leads a discussion or "causes" one, students seem to regard his performance as of more

note than their peers,

2. It is a good topic, but need not necessarily be understood,
3. If one checks "good" they may not find it necessary to check any other square,
4. A lecture need not necessarily be "good" but it may be understood;
5. There seems to be some discriminators operating for topic differences.

VI. Conclusions

There are two major conclusions to be drawn from the findings in the previous section. First, students do give meaningful, timed, hard copy feedback responses to teachers' behavior. Second, that if this feedback is even minimally used, as it was in this study, it can be expected to cause teachers to change their behavior and for many maintain this behavior, as evidenced by both six-set analysis and student-rating analysis. These changes in behavior are not regarded as any improvement in performances, nor do they indicate any quality in teaching.

It is felt that such rating devices, employed on a day-to day basis, or whatever time schedule can be organized, should be used by supervisors who wish to help their present teachers and by those individuals responsible for the training of future teachers.

The data further indicates that, in order to look at any affects and any relationships between student feedback and teacher behavior, it would be more valuable to look at small

sections of time and to focus on those small areas which constitute a one teacher one class interaction.

Appendix A
Sample Student Reaction Sheet

Teacher _____ Date _____

Too Fast / Too Slow	Interested / Bored	Understand / Don't Understand	Good	12:00 Comment
Too Fast / Too Slow	Interested / Bored	Understand / Don't Understand	Good	12:05 Comment
Too Fast / Too Slow	Interested / Bored	Understand / Don't Understand	Good	12:10 Comment
Too Fast / Too Slow	Interested / Bored	Understand / Don't Understand	Good	12:15 Comment
Too Fast / Too Slow	Interested / Bored	Understand / Don't Understand	Good	12:20 Comment
Too Fast / Too Slow	Interested / Bored	Understand / Don't Understand	Good	12:25 Comment
Too Fast / Too Slow	Interested / Bored	Understand / Don't Understand	Good	12:35 Comment

Appendix B

Six Set Matrix

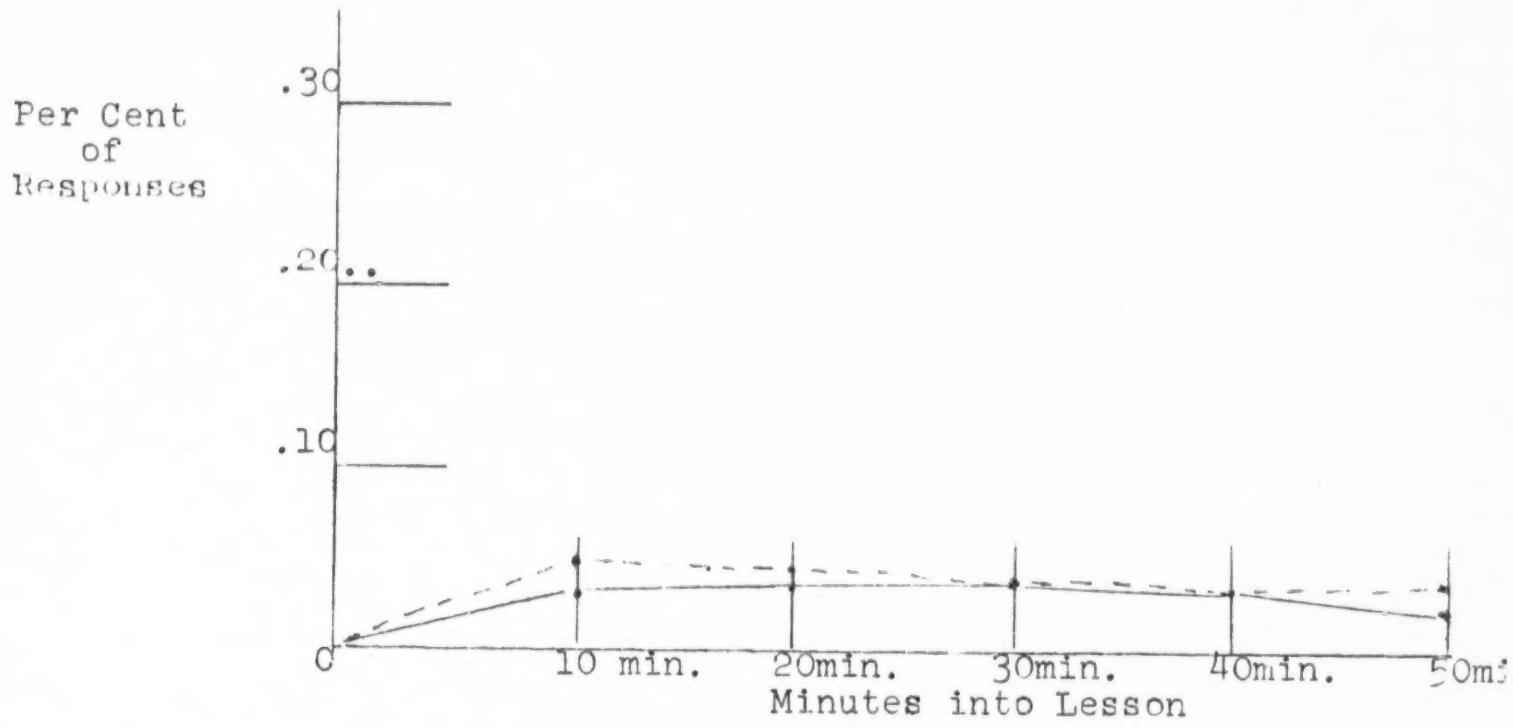
	6:0	5:1	4:2	3:3	2:4	1:5	0:6
6:0							
5:1							
4:2							
3:3							
2:4							
1:5							
0:6							

Cumulative Six Set

Lecture	Transition	Transition
Transition	Discussion	Transition
Transition	Transition	Transition

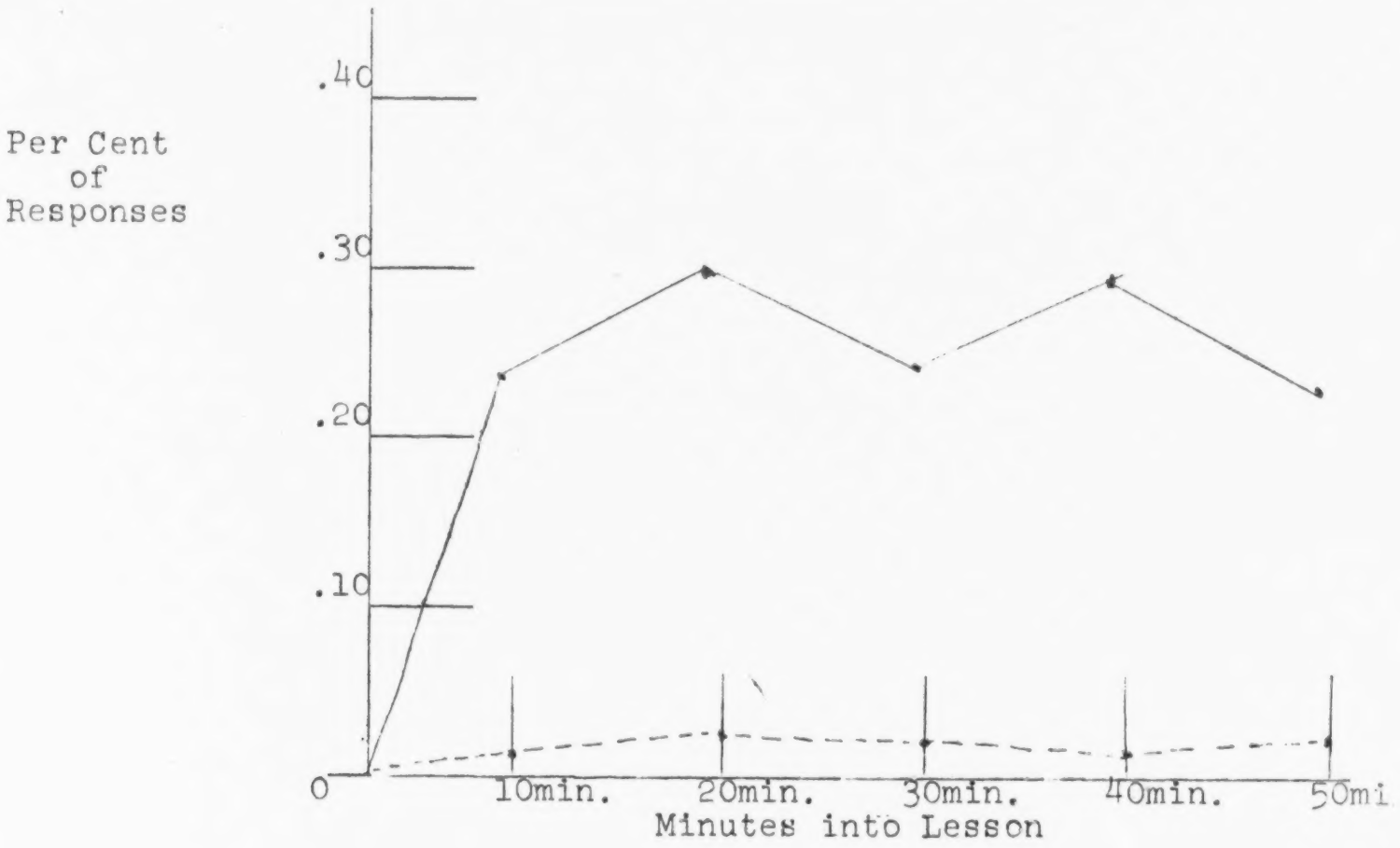
Appendix C Graph 1

Contrast of the Per Cent of Total Student Responses to Too Fast or Too Slow for Each Time Interval of the Lesso



Appendix C Graph 2

Contrast of the Per Cent of Total Student Responses to Interested or Bored for Each Time Interval of the Lesson

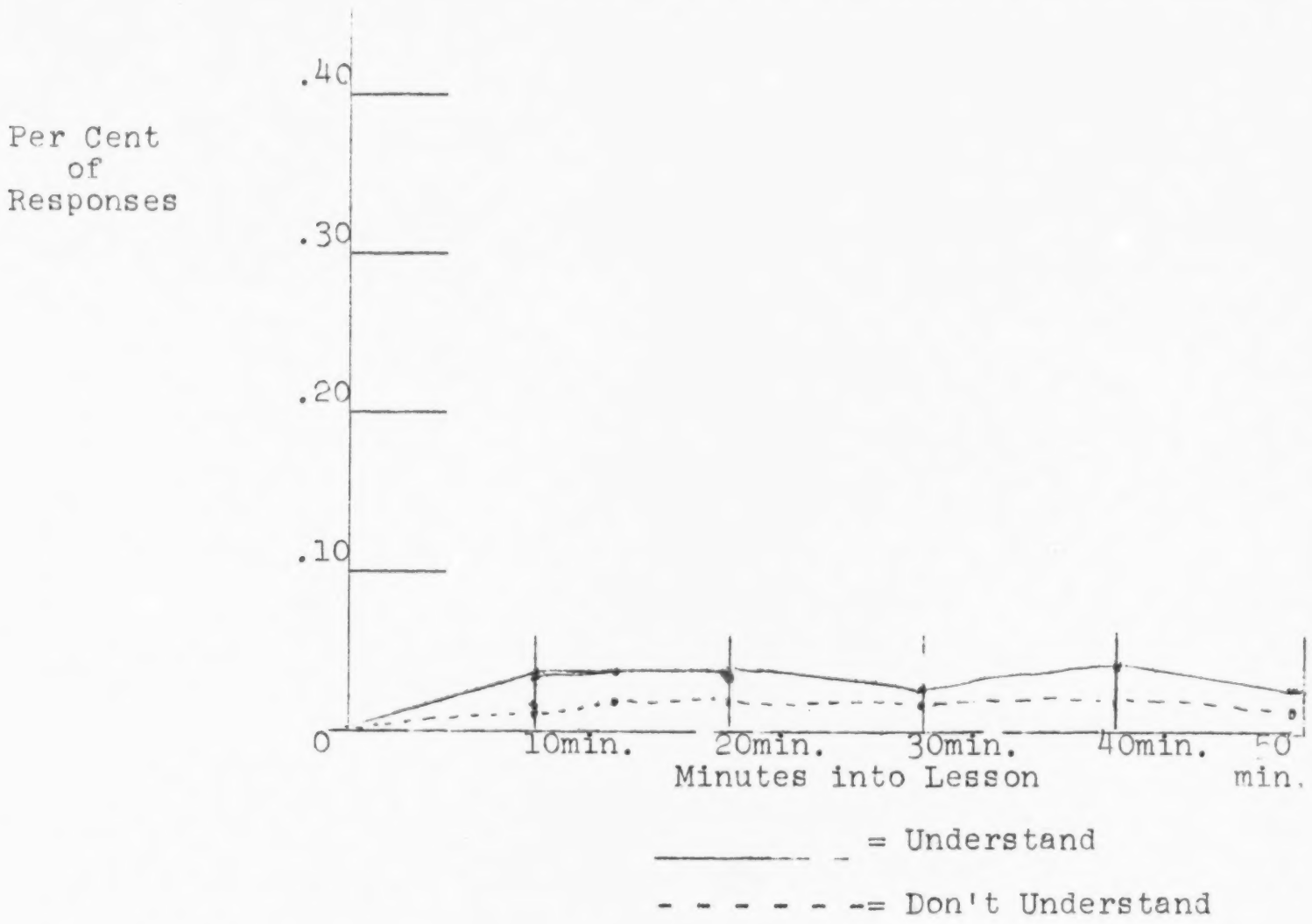


_____ = Interested

- - - - - - = Bored

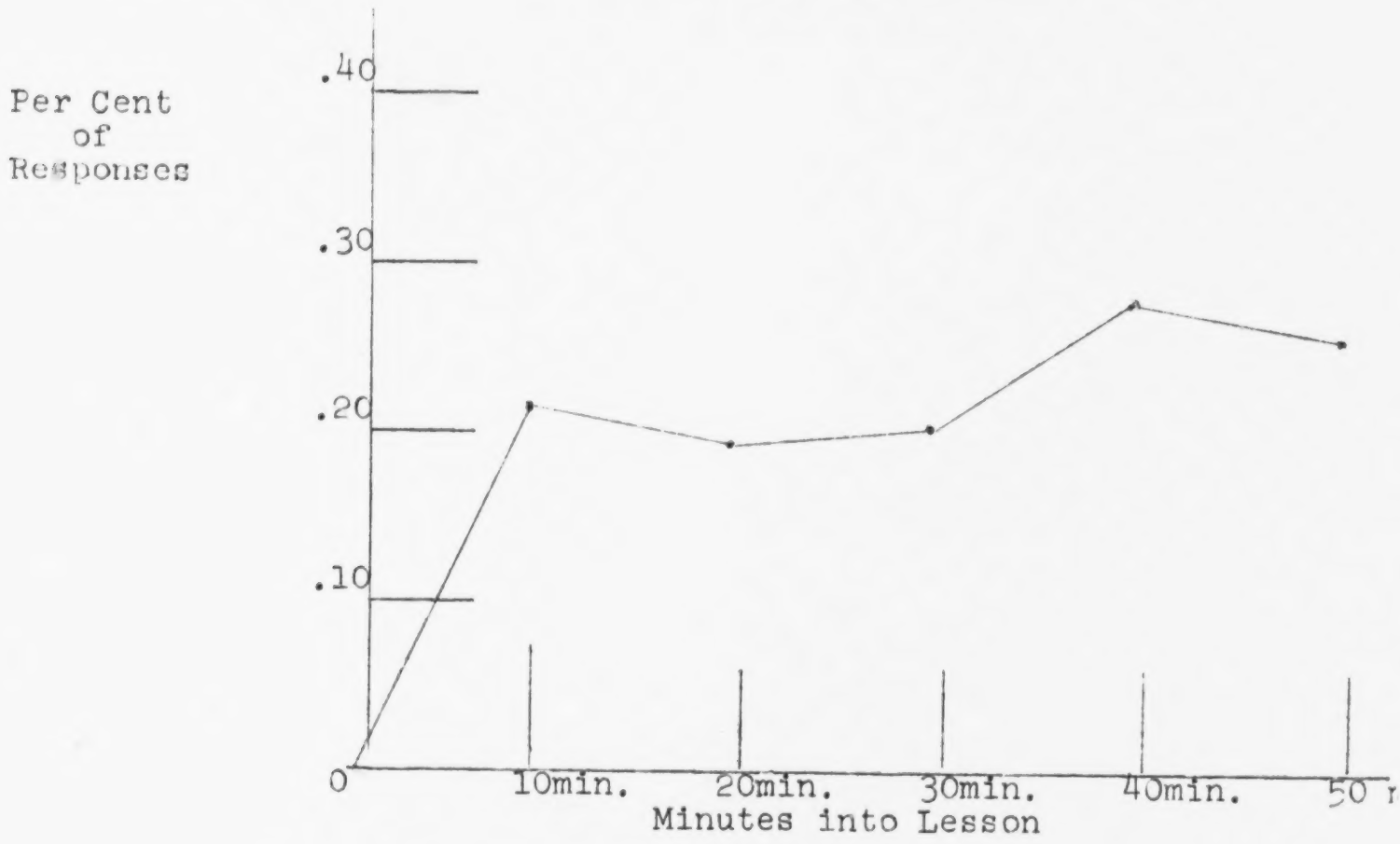
Appendix C Graph 3

Contrast of the Per Cent of Total Student Responses
to Understand or Don't Understand for Each Time Interval of Lesson



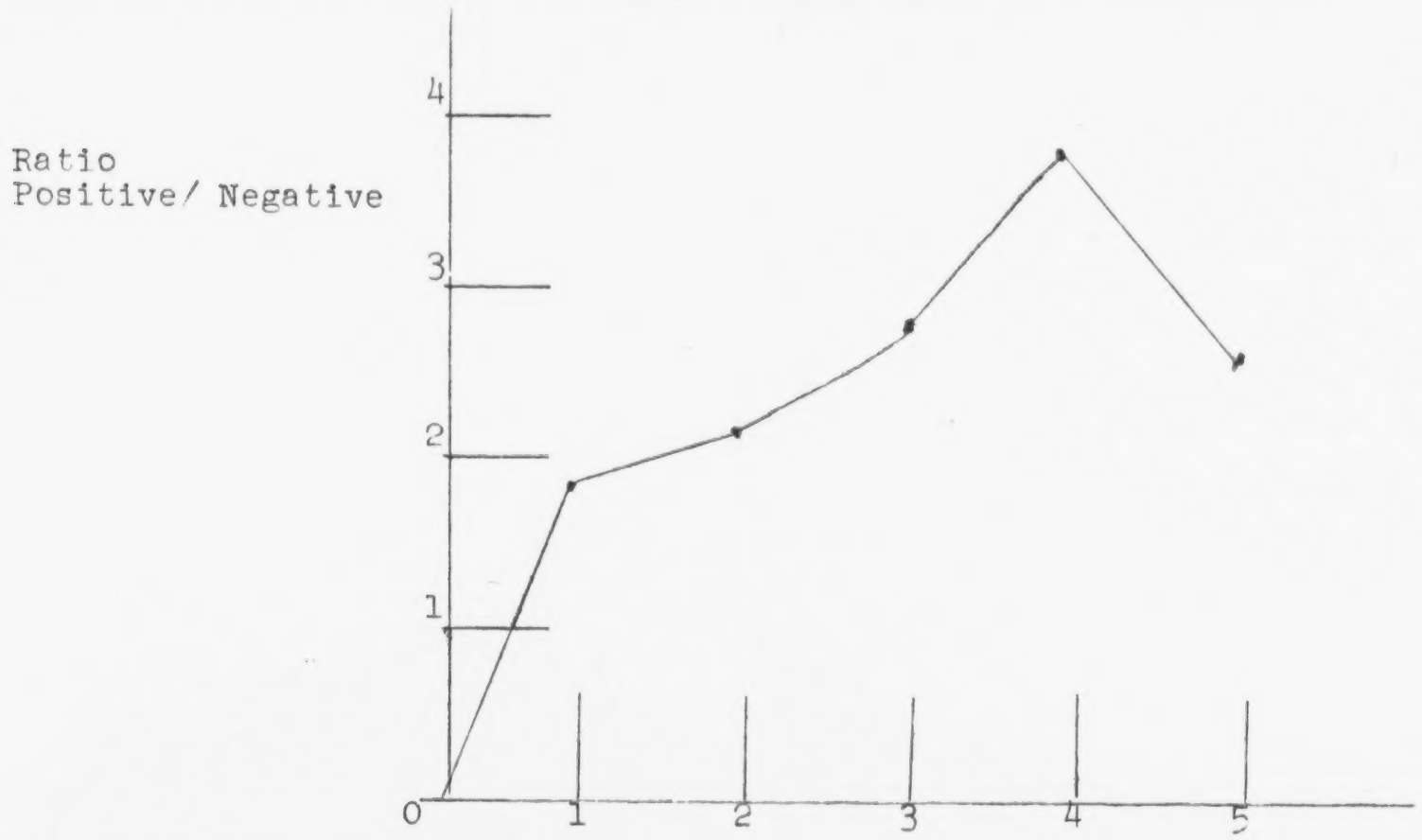
Appendix C Graph 4

Per Cent of Total Student Responses
to Good for Each Time Interval of the Lesson



Appendix D Graph 1

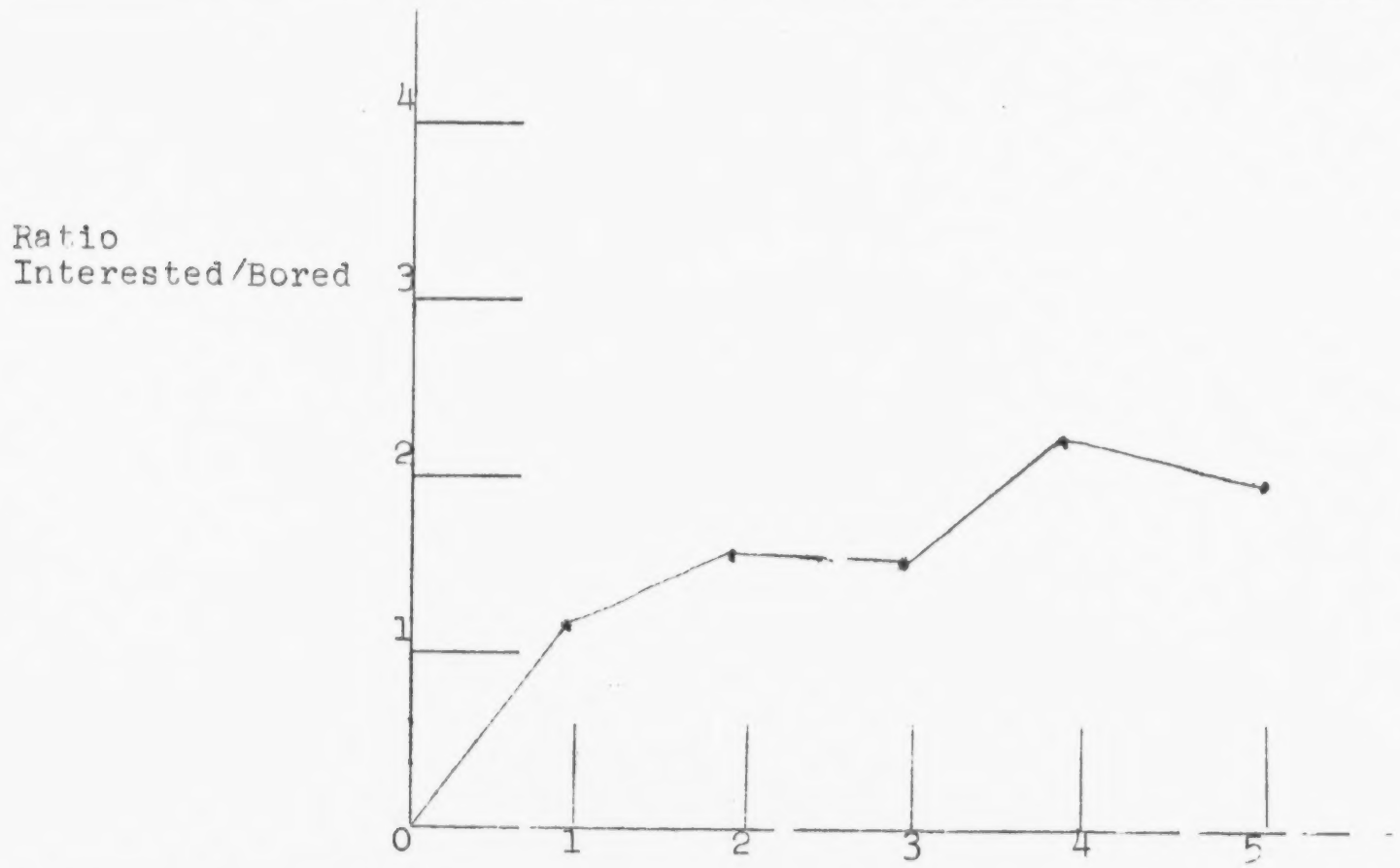
Overall Ratio of Positive/Negative Student Reations for All Teachers During the Second Month of the Study



1 = First time sheet used
2 = Second time sheet used
3 = Third time sheet used
4 = Fourth time sheet used
5 = Fifth time sheet used

Appendix D Graph 2

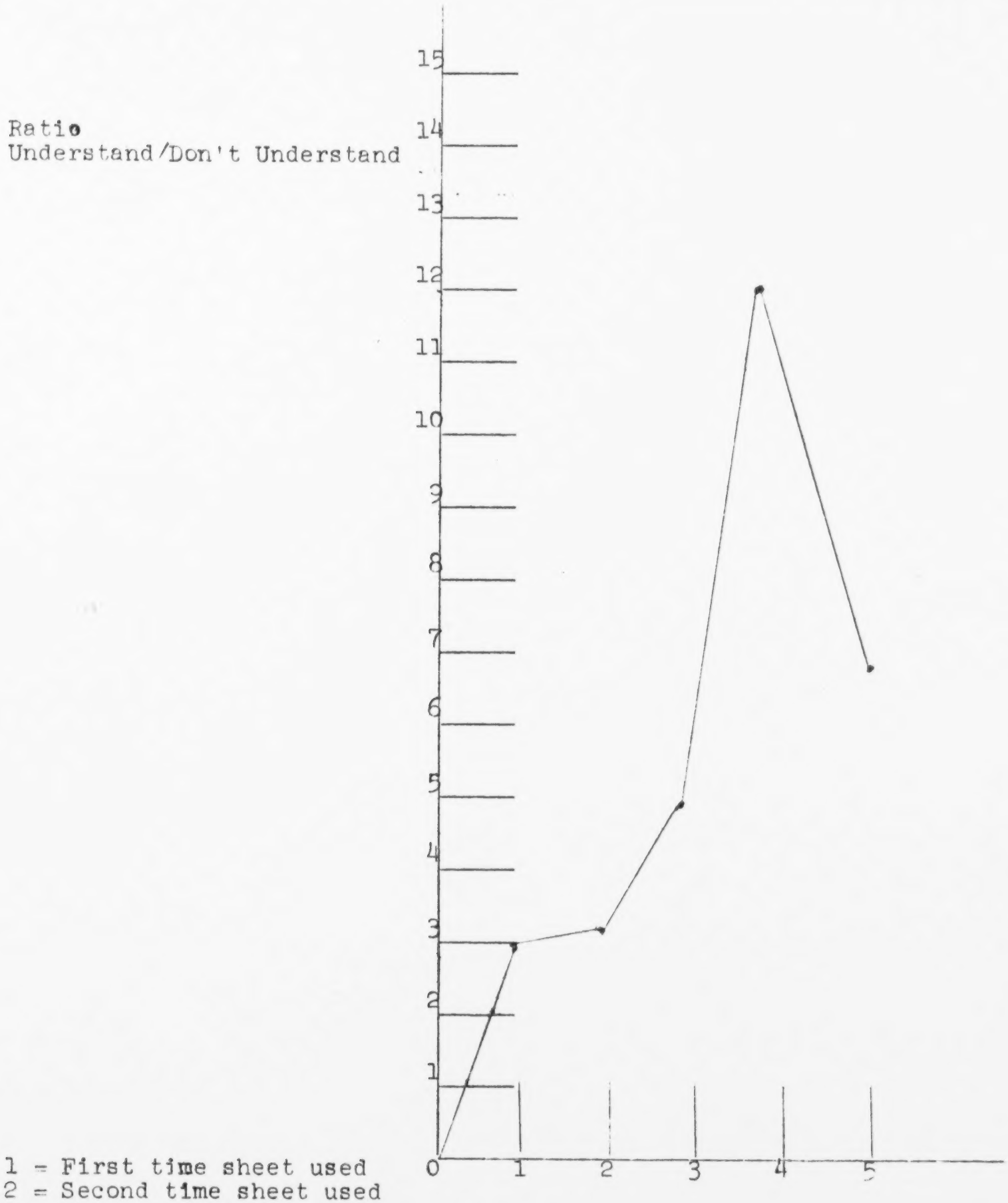
Overall Ratio of Interested/Bored Student Reactions for All Teachers During the Second Month of the Study



1 = First time used
2 = Second time used
3 = Third time used
4 = Fourth time used
5 = Fifth time used

Appendix D Graph 3

Overall Ratio of Understand/Don't Understand
Student Reactions for All Teachers During the Second Month of the Stu



1 = First time sheet used
2 = Second time sheet used
3 = Third time sheet used
4 = Fourth time sheet used
5 = Fifth time sheet used

Appendix E Table 1

Chi Square Values of each Teacher
and their Accompanying Levels of Significance
Comparing All Three Months
Month 1 to Month 2, Month 1 to Month 3, and Month 2 to Month 3

Teacher	All Months Chi Square	Level of Signif cance All Months	Month 1 to 2 Chi Square	Level of Signif- icance Months 1 to 2	Months 1 to 3 Chi Square	Level of Signif- icance Months 1 to 3	Months 2 to 3 Chi Square	Level of Signif- icance Months 2 to 3
A	18.4[a]	.001	47.56	.001	40.21	.001	19.9	.001
B	78.38		38.48	.01	42.69	.001	10.65	.05
C	4.33	.50	10.27	.15	69.31	.001	16.81	.015
D	55.33	.001	36.36	.001	19.13	.001	17.28	.002
E	23.08	.001	12.57	.02	33.44	.001	6.04	.15
F	25.87	.001	39.92	.001	7.73	.10	33.12	.001
G	71.90	.001	5.97	.25	12.43	.02	9.48	.05
H	24.09	.001	20.00	.001	.03	.50	18.31	.001
I	99.52	.001	30.61	.001	29.20	.001	20.82	.001
J	23.19	.001	4.15	.50	5.48	.25	5.82	.25
K	13.36	.01	23.17	.001	20.88	.001	9.68	.05
L	12.56[b]	.02	36.98	.001	5.42	.05	4.82	.10
M	19.12	.001	27.71	.001	7.72	.10	5.07	.25
N	41.93	.001	19.44	.001	23.98	.001	26.88	.001
O	12.02	.02	2.44	.50	6.81	.001	13.04	.001

a. To be read as 9.488 at .05% level of significance for 2 degrees freedom.
b. Exception to above to be read as 5.991 at .05% level of significance for 2 degrees of freedom.

Appendix E Table 2

Cumulative Frequencies of All Pupil Responses for All Teachers

Too Fast	Too Slow	Inter-ested	Bored	Under-stand	Don't Under-stand	Good	Total
97[a]	152	757	464	743	175	675	- 3063
.031[b]	.049	.245	.151	.240	.050	.220	First 10 minutes
140	171	1073	616	1110	281	741	3532
.039	.048	.304	.174	.317	.079	.209	Second 10 minutes
152	173	1184	640	1229	287	1003	-4668
.032	.037	.253	.136	.263	.061	.214	Third 10 minutes
83	108	820	493	884	184	788	-2760
.030	.031	.290	.178	.320	.066	.285	Fourth 10 minutes
56	42	423	264	450	93	478	1806
.031	.023	.234	.145	.249	.051	.259	Last 10 minutes

a. To be read as frequency of response for"too fast".
b. To be read that 3.1% of all first ten minute responses were recorded as "too fast".

Appendix E Table 3

Comparison	r x y	$\bar{x}$	$\bar{y}$
Lecture-Interest	-.0828	.4961	.2494
Discussion-Intest	-.1591	.1406	.2494
Transition-Interest	-.2353	.3597	.2494
Lecture-Understand	+.7553[a]	.4961	.2802
Discussion-Understand	-.4977[b]	.1406	.2802
Transition-Understand	-.6516[a]	.3597	.2802
Lecture-Good	-.4934[b]	.4961	.1763
Discussion-Good	-.1178	.1406	.1763
Transition-Good	+.6433[a]	.3597	.1765

a. Significant at the 5% level, for 14 degrees of freedom.

b. Significant at the 10% level, for 14 degrees of freedom.

BIBLIOGRAPHY

1. Bird, Grace E. "Pupils Estimate of Teachers," Journal of Educational Psychology, Vol. 8, 1917.

2. Bryan, Roy C. "Pupil Ratings of Secondary School Teachers," School Review, Vol. 46, May, 1938.

3. Albert, H.P. "An Analysis of Teacher Ratings by Pupils in San Antonio Texas," Educational Administration and Supervision, Vol. 27, April, 1941.

4. Bowman, Earl C. "Pupil Ratings of Student Teachers," Educational Administration and Supervision, Vol. 20, February, 1934.

5. Gage, N.L. Handbook of Research on Teaching, Chicago: Rand McNally and Company, 1963.

6. Smith, Alden W. "Students Evaluate Teaching," U.S. Dept. HEW, OE, 1969.

7. Hedges, W.D. and MacDougall, M.A. "Recording Student Perceptions of Teacher Behavior by Means of a Student Response Monitor," The Journal of Educational Research, Vol. 58, No. 4, 1964.

8. Coats, William D. "Students Perceptions of Teachers - A Factor Analytic Study," American Educational Research Association, Washington, D.C. Paper delivered at A.E.R.A., Minneapolis, Minnesota.

9. Parakh, Jal S. "A Study of Teacher-Pupil Interaction in High School Biology Classes," Unpublished Doctoral Dissertation, Cornell University, Ithica, New York, 1965.

10. Kondo, Alan K. "The Questioning Behavior of Teachers in the Science Curriculum Improvement Study Teaching," Presented at the NARST meeting, Pasadena, California, February 7, 1969.

11. Moser, Gene W. and Feldgoise, Roberta, "Project in the Use of Interaction Analysis to Increase the Use of the Inquiry Method in the Teaching of Science," Science Project Center Report, April, 1968.

12. Siegel, Sidney Nonparametric Statistics for the Behavioral Sciences, New York: McGraw Hill Book Company, Inc., 1956.

13. Simpson, G.G., Roe, A., and Lewontin, R.C., Quantitative Zoology, New York: Harcourt Brace and Company, 1960.